chedit by TT Validation Qualifiers in database

CETIFICATION

SDG No:

MC49081

Laboratory:

Accutest, Massachusetts

Site:

BMS, Building 5 Area, PR

Matrix:

Groundwater

Humacao, PR

SUMMARY:

Groundwater samples (Table 1) were collected on the BMSMC facility - Building 5 Area. The BMSMC facility is located in Humacao, PR. Samples were collected December 6 - 7, 2016 and were analyzed in Accutest Laboratory of Marlborough, Massachusetts that reported the data under SDG No.: MC49081. Results were validated using the following quality control criteria of the methods employed (MADEP VPH and MAPED EPH, Massachusets Department of Environmental Protection, 2004) and the latest validation guidelines (July, 2015) of the EPA Hazardous Waste Support Section. The analyses performed are shown in Table 1. Individual data review worksheets are enclosed for each target analyte group. The data sample organic data samples summary form shows for analytes results that were qualified.

In summary the results are valid and can be used for decision taking purposes.

Table 1. Samples analyzed and analysis performed

SAMPLE ID	SAMPLE DESCRIPTION	MATRIX	ANALYSIS PERFORMED
MC49081-1	EB120616	AQ – Equipment Blank	Volatiles TPHC Ranges Extractable TPHC Ranges
MC49081-2	UP-2	Groundwater	Volatiles TPHC Ranges Extractable TPHC Ranges
MC49081-3	FB120616	AQ – Field Blank Water	Volatiles TPHC Ranges Extractable TPHC Ranges
MC49081-4	EB120716	AQ – Equipment Blank	Volatiles TPHC Ranges Extractable TPHC Ranges
MC49081-5	S-40D	Groundwater	Volatiles TPHC Ranges Extractable TPHC Ranges
MC49081-6	S-41D	Groundwater	Volatiles TPHC Ranges Extractable TPHC Ranges
MC49081-6 MS	S-41D	Groundwater	Volatiles TPHC Ranges Extractable TPHC Ranges
MC49081-6 MSD	S-41D	Groundwater	Volatiles TPHC Ranges Extractable TPHC Ranges
MC49081-7	S-40S	Groundwater	Volatiles TPHC Ranges Extractable TPHC Ranges
MC49081-8	S-41S	Groundwater	Volatiles TPHC Ranges Extractable TPHC Ranges
MC49081-9	FB120716	AQ – Field Blank Water	Volatiles TPHC Ranges Extractable TPHC Ranges

Reviewer Name:

Rafael Infante

Chemist License 1888

Signature:

Date:

January 7, 2017

Méndaz IC # 1

Report of Analysis

By

AF

Prep Date

n/a

Page 1 of 1

Client Sample ID: EB120616 Lab Sample ID:

MC49081-1

AQ - Equipment Blank

Date Sampled: 12/06/16 Date Received: 12/10/16

Matrix: Method:

MADEP VPH REV 1.1

DF

1

Percent Solids: n/a

n/a

Project:

BMSMC, Building 5 Area, Puerto Rico

Analyzed

12/13/16

Analytical Batch Prep Batch

GBH2439

Run #1 Run #2

Purge Volume

File ID

BH40854.D

Run #1 5.0 ml

Run #2

Volatile TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C5- C8 Aliphatics (Unadj.)	ND	50	8.8	ug/l	
	C9- C12 Aliphatics (Unadj.)	ND	50	8.0	ug/l	
	C9- C10 Aromatics (Unadj.)	ND	50	9.7	ug/l	
	C5- C8 Aliphatics	ND	50	8.8	ug/l	
	C9- C12 Aliphatics	ND	50	8.0	ug/l	

CAS No. Surrogate Recoveries Run#1 Run#2 Limits

> 2,3,4-Trifluorotoluene 88% 70-130% 2,3,4-Trifluorotoluene 83% 70-130%





MDL = Method Detection Limit



E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

N = Indicates presumptive evidence of a compound

Report of Analysis

By

TA

Page 1 of 1

Client Sample ID: Lab Sample ID:

EB120616 MC49081-1

Date Sampled: 12/06/16

Date Received: 12/10/16

Matrix: Method:

AQ - Equipment Blank MADEP EPH REV 1.1 SW846 3510C

DF

1

Percent Solids: n/a

Project:

BMSMC, Building 5 Area, Puerto Rico

Prep Batch

Run #1

File ID DE16465.D Analyzed 12/21/16

Prep Date 12/19/16

OP49293

Analytical Batch **GDE918**

Run #2

Initial Volume 950 ml

Final Volume 2.0 ml

Run #1 Run #2

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C11-C22 Aromatics (Unadj.) C9-C18 Aliphatics C19-C36 Aliphatics C11-C22 Aromatics	ND ND ND ND	110 110 110 110	30 18 29 30	ug/l ug/l ug/l ug/l	
CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Lim	its	
84-15-1 321-60-8 3386-33-2 580-13-2	o-Terphenyl 2-Fluorobiphenyl 1-Chlorooctadecane 2-Bromonaphthalene	83% 73% 48% 76%		40-1 40-1 40-1 40-1	40% 40%	



ND = Not detected

MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

Report of Analysis

By

AF

Page 1 of 1

Client Sample ID: UP-2

Lab Sample ID:

MC49081-2

AQ - Ground Water

Date Sampled: 12/06/16

Matrix: Method:

MADEP VPH REV 1.1

DF

1

Date Received: 12/10/16 Percent Solids: n/a

Project:

BMSMC, Building 5 Area, Puerto Rico

Analyzed

12/13/16

Prep Batch

n/a

Analytical Batch **GBH2439**

Run #1 Run #2

Purge Volume

Run #1 Run #2

CAS No.

5.0 ml

File ID

BH40850.D

Volatile TPHC Ranges

CAS No. Compound Result RL MDL Units Q

ND

C5- C8 Aliphatics (Unadj.) 15.5 50 8.8 ug/l J C9- C12 Aliphatics (Unadj.) J 16.9 50 8.0 ug/l C9- C10 Aromatics (Unadj.) ĵ 10.1 50 9.7 ug/l C5- C8 Aliphatics 12.0 50 8.8 ug/l J

50

C9- C12 Aliphatics

Run# 1 Run# 2 Limits

70-130% 88% 83%

2,3,4-Trifluorotoluene 2,3,4-Trifluorotoluene

Surrogate Recoveries

70-130%

ug/l

8.0

Prep Date

n/a





MDL = Method Detection Limit

B = Indicates analyte found in associated method blank

N = Indicates presumptive evidence of a compound

Report of Analysis

Page 1 of 1

Client Sample ID: UP-2

Lab Sample ID:

MC49081-2

Matrix:

AQ - Ground Water

MADEP EPH REV 1.1 SW846 3510C

Date Sampled: 12/06/16 Date Received: 12/10/16

Percent Solids: n/a

BMSMC, Building 5 Area, Puerto Rico

Run #1 Run #2

Method:

Project:

File ID DE16475.D DF Analyzed 1 12/21/16

Ву Prep Date TA 12/19/16

Prep Batch OP49293

Q

Analytical Batch

GDE919

Initial Volume Final Volume Run #1 970 ml 2.0 ml

Run #2

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units
	C11-C22 Aromatics (Unadj.)	ND	100	30	ug/l
	C9-C18 Aliphatics	ND	100	17	ug/l
	C19-C36 Aliphatics	ND	100	28	ug/l
	C11-C22 Aromatics	ND	100	30	ug/l
CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Lim	its
84-15-1	o-Terphenyl	73%		40-1	40%
321-60-8	2-Fluorobiphenyl	64%		40-1	40%
3386-33-2	1-Chlorooctadecane	53%		40-1	40%
580-13-2	2-Bromonaphthalene	67%		40-1	40%
	-				



ND = Not detected

MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

Page 1 of 1

SGS Accutest LabLink@170787 10:23 04-Jan-2017

Report of Analysis

Client Sample ID: FB120616 Lab Sample ID:

MC49081-3

Matrix:

AQ - Field Blank Water

Method: Project:

MADEP VPH REV 1.1

BMSMC, Building 5 Area, Puerto Rico

Date Sampled: 12/06/16

Date Received: 12/10/16 Percent Solids: n/a

Q

	File ID	DF	Analyzed	Ву	Prep Date	Prep Batch	Analytical Batch
Run #1	BH40855.D	1	12/13/16	AF	n/a	n/a	GBH2439
Run #2							

Purge Volume

Run #1 Run #2 5.0 ml

Volatile TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units
	C5- C8 Aliphatics (Unadj.)	ND	50	8.8	ug/l
	C9- C12 Aliphatics (Unadj.)	ND	50	8.0	ug/l
	C9- C10 Aromatics (Unadj.)	ND	50	9.7	ug/l
	C5- C8 Aliphatics	ND	50	8.8	ug/l
	C9- C12 Aliphatics	ND	50	8.0	ug/l
CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits	
	2,3,4-Trifluorotoluene 2,3,4-Trifluorotoluene	83% 79%			30% 30%



ND = Not detected

MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

I = Indicates an estimated value

B = Indicates analyte found in associated method blank



Report of Analysis

Page 1 of 1

Client Sample ID: FB120616 Lab Sample ID:

MC49081-3

AQ - Field Blank Water

Date Sampled: 12/06/16

Matrix: Method:

MADEP EPH REV 1.1 SW846 3510C

Date Received: 12/10/16

Percent Solids: n/a

Project:

BMSMC, Building 5 Area, Puerto Rico

Prep Batch **Analytical Batch**

Run #1 Run #2 DE16468.D

File ID

Analyzed By TA 12/21/16

Prep Date 12/19/16

OP49293

GDE918

.

Initial Volume Run #1 990 ml

Final Volume 2.0 ml

Run #2

DF

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C11-C22 Aromatics (Unadj.) C9-C18 Aliphatics	ND ND	100 100	29 17	ug/l ug/l	
	C19-C36 Aliphatics	ND	100	27	ug/l	
	C11-C22 Aromatics	ND	100	29	ug/l	
CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Lim	its	
84-15-1	o-Terphenyl	76%		40-1	40%	
321-60-8	2-Fluorobiphenyl	64%		40-1	40%	
3386-33-2	1-Chlorooctadecane	40%		40-1	40%	
580-13-2	2-Bromonaphthalene	67%		40-1	40%	
	-					,



ND = Not detected

MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

Report of Analysis

Page 1 of 1

Client Sample ID: EB120716 Lab Sample ID:

MC49081-4

Date Sampled: 12/07/16

Matrix: Method:

AQ - Equipment Blank MADEP VPH REV 1.1

DF

Date Received: 12/10/16 Percent Solids: n/a

Project:

BMSMC, Building 5 Area, Puerto Rico

Analytical Batch

Run #1 Run #2 BH40868A.D

File ID

12/14/16 AF

Ву

Analyzed

n/a

Prep Date

Prep Batch n/a

GBH2441

Purge Volume

Run #1

5.0 ml

Run #2

Volatile TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q

C5- C8 Aliphatics (Unadj.)	ND	50	8.8	ug/l
C9- C12 Aliphatics (Unadj.)	ND	50	8.0	ug/l
C9- C10 Aromatics (Unadj.)	ND	50	9.7	ug/l
C5- C8 Aliphatics	ND	50	8.8	ug/l
C9- C12 Aliphatics	ND	50	8.0	ug/l

CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limits
---------	----------------------	--------	--------	--------

2,3,4-Trifluorotoluene	83%	70-130%
2,3,4-Trifluorotoluene	79%	70-130%



ND = Not detected

MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

I = Indicates an estimated value

B = Indicates analyte found in associated method blank



Report of Analysis

By

TA

Page 1 of 1

Client Sample ID: EB120716 Lab Sample ID:

MC49081-4

AQ - Equipment Blank

DF

1

Date Sampled: 12/07/16

Matrix: Method:

MADEP EPH REV 1.1 SW846 3510C

Date Received: 12/10/16 Percent Solids: n/a

Project:

BMSMC, Building 5 Area, Puerto Rico

Analyzed

12/26/16

Prep Batch

Q

Analytical Batch

Run #1 Run #2

File ID

Final Volume

12/21/16

Prep Date

OP49307

GDE920

Initial Volume 960 ml

DE16483.D

2.0 ml

Run #1 Run #2

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	
	C11-C22 Aromatics (Unadj.)	ND	100	30	ug/l	
	C9-C18 Aliphatics	ND	100	17	ug/l	
	C19-C36 Aliphatics	ND	100	28	ug/l	
	C11-C22 Aromatics	ND	100	30	ug/l	
CAS No.	Surrogate Recoveries	Run# 1	Run#2	Lim	its	
84-15-1	o-Terphenyl	77%		40-1	40%	
321-60-8	2-Fluorobiphenyl	68%		40-1	40%	
3386-33-2	1-Chlorooctadecane	42%		40-1	40%	
580-13-2	2-Bromonaphthalene	70%		40-1	40%	
	-					



ND = Not detected

MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank



Report of Analysis

Ву

AF

Page 1 of 1

Client Sample ID: S-40D

Lab Sample ID:

MC49081-5

Matrix:

AQ - Ground Water

n/a

Date Sampled: 12/07/16

Date Received: 12/10/16

Method:

MADEP VPH REV 1.1

DF

Percent Solids: n/a

Q

Project:

BMSMC, Building 5 Area, Puerto Rico

Analyzed

12/13/16

Prep Date

Prep Batch n/a

Analytical Batch GBH2439

Run #1 Run #2

Purge Volume

Run #1

5.0 ml

File ID

BH40851.D

Run #2

Volatile TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Unit
	C5- C8 Aliphatics (Unadj.)	ND	50	8.8	ug/l
	C9- C12 Aliphatics (Unadj.)	ND	50	8.0	ug/l
	C9- C10 Aromatics (Unadj.)	ND	50	9.7	ug/l
	C5- C8 Aliphatics	ND	50	8.8	ug/l
	C9- C12 Aliphatics	ND	50	8.0	ug/l
CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Lim	its
	2,3,4-Trifluorotoluene	88%		70-1	30%
	2,3,4-Trifluorotoluene	83%		70-1	30%



ND = Not detected

MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank



Report of Analysis

By

TA

Prep Date

12/21/16

Page 1 of 1

Client Sample ID: S-40D Lab Sample ID:

MC49081-5

Date Sampled: 12/07/16

Matrix:

AQ - Ground Water

DF

1

Date Received: 12/10/16

Method:

MADEP EPH REV 1.1 SW846 3510C

Percent Solids: n/a

Q

Project:

BMSMC, Building 5 Area, Puerto Rico

Analyzed

12/27/16

Analytical Batch Prep Batch OP49307 GDE921

Run #1 Run #2

Initial Volume Final Volume

Run #1

2.0 ml

Run #2

Extractable TPHC Ranges

File ID

990 ml

DE16503.D

CAS No.	Compound	Result	RL	MDL	Units	
	C11-C22 Aromatics (Unadj.) C9-C18 Aliphatics C19-C36 Aliphatics C11-C22 Aromatics	ND ND ND ND	100 100 100 100	29 17 27 29	ug/l ug/l ug/l ug/l	
CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Lim	its	
84-15-1 321-60-8 3386-33-2 580-13-2	o-Terphenyl 2-Fluorobiphenyl 1-Chlorooctadecane 2-Bromonaphthalene	70% 65% 46% 67%		40-1 40-1 40-1 40-1	40%	



ND = Not detected

MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

Report of Analysis

Ву

AF

RL

Page 1 of 1

Client Sample ID: S-41D

Lab Sample ID:

MC49081-6

Date Sampled: 12/07/16

Matrix: Method:

AQ - Ground Water MADEP VPH REV 1.1

DF

1

Percent Solids: n/a

Date Received: 12/10/16

Project:

BMSMC, Building 5 Area, Puerto Rico

Run #1

File ID BH40843.D Analyzed 12/13/16

Prep Date n/a

Prep Batch n/a

Q

Analytical Batch GBH2439

Run #2

Purge Volume

Run #1

5.0 ml

Run #2

CAS No.

Volatile TPHC Ranges

CAS No. Compound

> C5- C8 Aliphatics (Unadj.) C9- C12 Aliphatics (Unadj.)

ND ND C9- C10 Aromatics (Unadj.) ND ND 50 8.8 50 8.0 50 9.7

MDL

Units

ug/l

ug/l

ug/l

ug/l

ug/l

50 8.8 50 8.0

Run#1

ND

Result

Run#2

Limits

2,3,4-Trifluorotoluene 2,3,4-Trifluorotoluene

Surrogate Recoveries

C5- C8 Aliphatics

C9- C12 Aliphatics

88% 84% 70-130% 70-130%



ND = Not detected

MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

Report of Analysis

Page 1 of 1

Client Sample ID: S-41D

Lab Sample ID:

MC49081-6

Matrix: Method:

Project:

AQ - Ground Water

MADEP EPH REV 1.1 SW846 3510C BMSMC, Building 5 Area, Puerto Rico

Date Sampled: 12/07/16

Date Received: 12/10/16

Percent Solids: n/a

Prep Batch Analytical Batch File ID DF Analyzed By Prep Date **GDE920** Run #1 DE16485.D 1 12/26/16 TA 12/21/16 OP49307

Run #2

Initial Volume Final Volume 2.0 ml 960 ml

Run #1 Run #2

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	Q
	C11-C22 Aromatics (Unadj.) C9-C18 Aliphatics C19-C36 Aliphatics C11-C22 Aromatics	ND ND ND ND	100 100 100 100	30 17 28 30	ug/l ug/l ug/l ug/l	
CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Lim	its	
84-15-1 321-60-8 3386-33-2 580-13-2	o-Terphenyl 2-Fluorobiphenyl 1-Chlorooctadecane 2-Bromonaphthalene	72% 67% 40% 70%		40-1 40-1	40% 40% 40% 40%	



ND = Not detected

MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank



Report of Analysis

Ву

AF

Prep Date

n/a

Page 1 of 1

Client Sample ID: S-40S Lab Sample ID:

MC49081-7

AQ - Ground Water

Date Sampled: 12/07/16

n/a

Q

Matrix: Method:

MADEP VPH REV 1.1

DF

1

Date Received: 12/10/16 Percent Solids: n/a

Project:

BMSMC, Building 5 Area, Puerto Rico

Analyzed

12/13/16

Prep Batch

Analytical Batch GBH2439

Run #1 Run #2

Purge Volume

Run #1

5.0 ml

File ID

BH40852.D

Run #2

Volatile TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units
	C5- C8 Aliphatics (Unadj.) C9- C12 Aliphatics (Unadj.) C9- C10 Aromatics (Unadj.) C5- C8 Aliphatics C9- C12 Aliphatics	ND ND ND ND ND	50 50 50 50 50	8.8 8.0 9.7 8.8 8.0	ug/l ug/l ug/l ug/l ug/l
CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Limi	its
	2,3,4-Trifluorotoluene 2,3,4-Trifluorotoluene	87% 82%		70-1 70-1	



ND = Not detected

MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank



Report of Analysis

Page 1 of 1

Client Sample ID: S-40S

MC49081-7

Lab Sample ID: Matrix:

AQ - Ground Water

Date Sampled: 12/07/16

Method:

MADEP EPH REV 1.1 SW846 3510C

Date Received: 12/10/16

Project:

BMSMC, Building 5 Area, Puerto Rico

Percent Solids: n/a

File ID DE16486.D Analyzed 12/26/16

Ву Prep Date TA 12/21/16

Prep Batch OP49307

Analytical Batch **GDE920**

Run #1 Run #2

Initial Volume Final Volume

DF

1

Run #1 Run #2 2.0 ml

Extractable TPHC Ranges

990 ml

CAS No.	Compound	Result	RL	MDL	Units	Q
	C11-C22 Aromatics (Unadj.)	ND	100	29	ug/l	
	C9-C18 Aliphatics	ND	100	17	ug/l	
	C19-C36 Aliphatics	ND	100	27	ug/l	
	C11-C22 Aromatics	ND	100	29	ug/l	
CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Lim	its	
84-15-1	o-Terphenyl	68%		40-1	40%	
321-60-8	2-Fluorobiphenyl	66%		40-1	40%	
3386-33-2	1-Chlorooctadecane	40%		40-1	40%	
580-13-2	2-Bromonaphthalene	69%		40-1	40%	



ND = Not detected

MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

Report of Analysis

Page 1 of 1

Client Sample ID: S-41S

Lab Sample ID:

MC49081-8

Matrix:

AQ - Ground Water

Method:

MADEP VPH REV 1.1

Date Received: 12/10/16

Percent Solids: n/a

Date Sampled: 12/07/16

Project: BMSMC, Building 5 Area, Puerto Rico

Run #1

DF Analyzed BH40853.D 12/13/16

Ву AF Prep Date n/a

Prep Batch

Q

Analytical Batch

GBH2439 n/a

Run #2

Purge Volume

Run #1 Run #2 5.0 ml

File ID

Volatile TPHC Ranges

CAS No.	Compound	Result	KL	MDL	Units
	C5- C8 Aliphatics (Unadj.)	ND	50	8.8	ug/l
	C9- C12 Aliphatics (Unadj.)	ND	50	8.0	ug/l
	C9- C10 Aromatics (Unadj.)	ND	50	9.7	ug/l
	C5- C8 Aliphatics	ND	50	8.8	ug/l
	C9- C12 Aliphatics	ND	50	8.0	ug/l
CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Lim	ita
CAS No.	Sur l'ogate Recover les	Kull# 1	Kull# 2	Lilli	113
	2,3,4-Trifluorotoluene	89%		70-1	30%
	2,3,4-Trifluorotoluene	84%		70-1	30%





MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank



Report of Analysis

By

TA

Prep Date

40-140%

12/21/16

Page 1 of 1

Client Sample ID:

S-41S MC49081-8

Lab Sample ID: Matrix:

AQ - Ground Water

DF

1

Date Sampled: 12/07/16

Method:

MADEP EPH REV 1.1 SW846 3510C

Percent Solids: n/a

Date Received: 12/10/16

Project:

BMSMC, Building 5 Area, Puerto Rico

Analyzed

12/27/16

Prep Batch OP49307

Analytical Batch GDE921

Run #1

Run #2

Initial Volume Final Volume

970 ml 2.0 ml

2-Bromonaphthalene

Run #1 Run #2

580-13-2

Extractable TPHC Ranges

File ID

DE16504.D

CAS No.	Compound	Result	RL	MDL	Units	Q

C11-C22 Aromatics (Unadj.)	31.5	100	30	ug/l	J
C9-C18 Aliphatics	25.9	100	17	ug/l	J
C19-C36 Aliphatics	54.9	100	28	ug/l	j
C11-C22 Aromatics	31.5	100	30	ug/l	J

59%

CAS No. Run#1 Run#2 Limits Surrogate Recoveries 84-15-1 o-Terphenyl 59% 40-140% 40-140% 321-60-8 2-Fluorobiphenyl 58% 3386-33-2 1-Chlorooctadecane 44% 40-140%



ND = Not detected

MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

Report of Analysis

Ву

AF

Page 1 of 1

Client Sample ID: FB120716 Lab Sample ID:

MC49081-9

Matrix:

AQ - Field Blank Water MADEP VPH REV 1.1

DF

1

Percent Solids: n/a

Date Sampled: 12/07/16 Date Received: 12/10/16

Method: Project:

BMSMC, Building 5 Area, Puerto Rico

Run #1 Run #2

File ID BH40857.D Analyzed 12/13/16

Prep Date n/a

Prep Batch n/a

Q

Analytical Batch **GBH2439**

Purge Volume

Run #1 Run #2 5.0 ml

Volatile TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Unit
	C5- C8 Aliphatics (Unadj.)	ND	50	8.8	ug/l
	C9- C12 Aliphatics (Unadj.)	ND	50	8.0	ug/l
	C9- C10 Aromatics (Unadj.)	ND	50	9.7	ug/l
	C5- C8 Aliphatics	ND	50	8.8	ug/l
	C9- C12 Aliphatics	ND	50	8.0	ug/l

CAS No. Surrogate Recoveries

2,3,4-Trifluorotoluene

2,3,4-Trifluorotoluene

Run#1

87%

83%

Run#2 Limits

> 70-130% 70-130%



ND = Not detected

MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

Report of Analysis

By

TA

Page 1 of 1

Client Sample ID: FB120716 Lab Sample ID:

MC49081-9

Matrix:

AQ - Field Blank Water

DF

1

Date Sampled: 12/07/16 Date Received: 12/10/16

Method:

MADEP EPH REV 1.1 SW846 3510C

Percent Solids: n/a

Prep Batch

OP49307

Project:

BMSMC, Building 5 Area, Puerto Rico

Analyzed

12/26/16

Q

Prep Date

12/21/16

Analytical Batch GDE920

Run #1 Run #2

Initial Volume Final Volume

960 ml

File ID

DE16489.D

2.0 ml

Run #1 Run #2

Extractable TPHC Ranges

CAS No.	Compound	Result	RL	MDL	Units	
	C11-C22 Aromatics (Unadj.) C9-C18 Aliphatics	ND ND	100	30 17	ug/l	
	C19-C36 Aliphatics	ND	100	28	ug/l ug/l	
	C11-C22 Aromatics	ND	100	30	ug/l	
CAS No.	Surrogate Recoveries	Run# 1	Run# 2	Lim	its	
84-15-1	o-Terphenyl	79%		40-1	40%	
321-60-8	2-Fluorobiphenyl	70%		40-1	40%	
3386-33-2	1-Chlorooctadecane	52%		40-1	40%	
580-13-2	2-Bromonaphthalene	73%		40-1	40%	



ND = Not detected

MDL = Method Detection Limit

RL = Reporting Limit

E = Indicates value exceeds calibration range

J = Indicates an estimated value

B = Indicates analyte found in associated method blank

Page 1 of 1

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC49081

AMANYWP Anderson Mulholland and Assoc. Account:

BMSMC, Building 5 Area, Puerto Rico Project:

MC49081-6MS BH40844.D 1 12/13/16 AF n. MC49081-6MSD BH40845.D 1 12/13/16 AF n.	Prep Date Prep Batch Analytical Batch n/a n/a GBH2439 n/a n/a GBH2439 n/a GBH2439
--	---

The QC reported here applies to the following samples:

Method: MADEP VPH REV 1.1

MC49081-1, MC49081-2, MC49081-3, MC49081-5, MC49081-6, MC49081-7, MC49081-8, MC49081-9

Compound	MC49081-6 ug/l Q	Spike ug/l	MS ug/l	MS %	Spike ug/l	MSD ug/l	MSD %	RPD	Limits Rec/RPD
C5- C8 Aliphatics (Unadj.) C9- C12 Aliphatics (Unadj.) C9- C10 Aromatics (Unadj.)	ND ND ND	300 450 150	277 438 146	93 109 97	300 450 150	278 437 146	93 109 97	0 0 0	70-130/25 70-130/25 70-130/25
Surrogate Recoveries	MS	MSD	МС	C49081-6	Limits				
2,3,4-Trifluorotoluene 2,3,4-Trifluorotoluene	94% 89%	95% 89%		-		_		.084	
	C5- C8 Aliphatics (Unadj.) C9- C12 Aliphatics (Unadj.) C9- C10 Aromatics (Unadj.) Surrogate Recoveries 2,3,4-Trifluorotoluene	Compound ug/l Q C5- C8 Aliphatics (Unadj.) ND C9- C12 Aliphatics (Unadj.) ND C9- C10 Aromatics (Unadj.) ND Surrogate Recoveries MS 2,3,4-Trifluorotoluene 94%	Compound ug/l Q ug/l C5- C8 Aliphatics (Unadj.) ND 300 C9- C12 Aliphatics (Unadj.) ND 450 C9- C10 Aromatics (Unadj.) ND 150 Surrogate Recoveries MS MSD 2,3,4-Trifluorotoluene 94% 95%	Compound ug/l Q ug/l ug/l C5- C8 Aliphatics (Unadj.) ND 300 277 C9- C12 Aliphatics (Unadj.) ND 450 438 C9- C10 Aromatics (Unadj.) ND 150 146 Surrogate Recoveries MS MSD MG 2,3,4-Trifluorotoluene 94% 95% 889	Compound ug/l Q ug/l ug/l % C5- C8 Aliphatics (Unadj.) ND 300 277 93 C9- C12 Aliphatics (Unadj.) ND 450 438 109 C9- C10 Aromatics (Unadj.) ND 150 146 97 Surrogate Recoveries MS MSD MC49081-6 2,3,4-Trifluorotoluene 94% 95% 88%	Compound ug/l Q ug/l ug/l % ug/l C5- C8 Aliphatics (Unadj.) ND 300 277 93 300 C9- C12 Aliphatics (Unadj.) ND 450 438 109 450 C9- C10 Aromatics (Unadj.) ND 150 146 97 150 Surrogate Recoveries MS MSD MC49081-6 Limits 2,3,4-Trifluorotoluene 94% 95% 88% 70-1309	Compound ug/l Q ug/l ug/l % ug/l ug/l ug/l C5- C8 Aliphatics (Unadj.) ND 300 277 93 300 278 C9- C12 Aliphatics (Unadj.) ND 450 438 109 450 437 C9- C10 Aromatics (Unadj.) ND 150 146 97 150 146 Surrogate Recoveries MS MSD MC49081-6 Limits 2,3,4-Trifluorotoluene 94% 95% 88% 70-130%	Compound ug/l Q ug/l ug/l % ug/l ug/l % C5- C8 Aliphatics (Unadj.) ND 300 277 93 300 278 93 C9- C12 Aliphatics (Unadj.) ND 450 438 109 450 437 109 C9- C10 Aromatics (Unadj.) ND 150 146 97 150 146 97 Surrogate Recoveries MS MSD MC49081-6 Limits 2,3,4-Trifluorotoluene 94% 95% 88% 70-130%	Compound ug/l Q ug/l ug/l wg/l ug/l wg/l ug/l % RPD C5- C8 Aliphatics (Unadj.) ND 300 277 93 300 278 93 0 C9- C12 Aliphatics (Unadj.) ND 450 438 109 450 437 109 0 C9- C10 Aromatics (Unadj.) ND 150 146 97 150 146 97 0 Surrogate Recoveries MS MSD MC49081-6 Limits 2,3,4-Trifluorotoluene 94% 95% 88% 70-130% 2,3,4-Trifluorotoluene 89% 89% 84% 70-130%



^{* =} Outside of Control Limits.

Page 1 of 1

Matrix Spike/Matrix Spike Duplicate Summary

Job Number: MC49081

Account:

AMANYWP Anderson Mulholland and Assoc.

Project:

BMSMC, Building 5 Area, Puerto Rico

Sample File ID DF Analyzed By OP49307-MS DE16481.D 1 12/26/16 TA OP49307-MSD DE16482.D 1 12/26/16 TA MC49081-6 DE16485.D 1 12/26/16 TA	Prep Date	Prep Batch	Analytical Batch
	12/21/16	OP49307	GDE920
	12/21/16	OP49307	GDE920
	12/21/16	OP49307	GDE920

The QC reported here applies to the following samples:

Method: MADEP EPH REV 1.1

MC49081-4, MC49081-5, MC49081-6, MC49081-7, MC49081-8, MC49081-9

CAS No.	Compound	MC49081-6 ug/l Q	Spike ug/l	MS ug/l	MS %	Spike ug/l	MSD ug/l	MSD %	RPD	Limits Rec/RPD
	C11-C22 Aromatics (Unadj.)	ND	833	723	83	851	585	65	21	40-140/25
	C9-C18 Aliphatics	ND	312	208	67	319	181	57	14	40-140/25
	C19-C36 Aliphatics	ND	417	394	95	426	348	82	12	40-140/25

CAS No. St	urrogate Recoveries	MS	MSD	MC49081-6	Limits
84-15-1 o-	Terphenyl	87%	69%	72%	40-140%
321-60-8 2-	Fluorobiphenyl	73%	66%	67%	40-140%
	Chlorooctadecane	51%	51%	40%	40-140%
580-13-2 2-	-Bromonaphthalene	74%	67%	70%	40-140%



^{* =} Outside of Control Limits.

CHAIN OF CUSTODY

Acc	CUTEST				СНАІ	N C	F (CUST	roı	DΥ	,										PΑ	GE	1	Of	=_[
	MA			50 D'Angale Draw, Building One, Marishanough, MA 01732 TEL 308-481-5200 FAX 501-481-7731 An							7	Treebon 7	89:	559	523		Onner Carr	M	49	708	?/				
Ciler	nt / Reporting Information	1-33			Project	Informe	tion	Mary Add	Agica A		utic;	mè	6497	100	1550	Reg	pasted A	natyels	[680 T	PEST (CODE	sheet)	إسب	dants.	Matrix Codes
Company Name			Project Name											- 1						1			1 1		DW - Orynag Viater
Anderson Mul	Iholland & Associates		4th C 2016 G	roundwater Sa	mpling - On	site We	lls											- 1		1			1 1		GW - Ground Werer
Street Address			Street			Commence of the Commence of th	THA P. L. O.	1	TAXABLE PARTY.			-	MENTAL PROPERTY.							1					WW - Weser SW - Surface Weler
2700 Weetche	ster Avenue, Sulta 417 State				-	Blitting I	informati	in { U diffe	rent fro	en Re	port l	0)		_			1 1		1	1					SO-Sol SL-Sludge
		Σφ	Cay		State PR	Campan	y Marine												1	ı			1	ļ	SED-Sademore
Purchase Projet Current	NY	10577 E-mail	Humação Project 6		FR	Street A	ddrese													1				- 1	Oi+ Oil LIQ+ Other Liqued
Terry Taylo						1								H						1					AR-Ar
Phone #	ч	Fax F	Chart Purchase	Order If		Cay			Sü	rig			Σφ	\dashv				ļ		1]	ı		SOL - Other Solid V/P - Wilpe
214-251-04	00													_1				1						- 1	FB-Field Blank EB-Equation of Blank
Sampler(s) Neme	(6)	Phune #	Protect Manager			Allenion	ı											ł		Ì	1			- 1	Atta-Retse Blank
			Terry Taylor			<u> </u>								_	#	\$									18-Trp Blank
i i					Cohectes	_			T.	London T	at pro	1	Delition .	\dashv	ŝ	5			1	1			ı	- }	
torgin 7 Fig.	ld ID / Point of Collection		MECHO! Vel II	Date	Time	Sumpled by	SALES .	Pal John	Ţ Ž	10	POSQL		P P		VMAVPHR	BMAEPHR									LAB USE ONLY
IN E	B120616			12-6-16	1023		EBI	5	5	Н		Н		Н	X	X		-							
-2 1	P-2			12-6-16	1534	NŘ	БW	6	<u>त.</u>	П		П		П	Y	X			П					П	
-3 F	B120616			12-6-16	1620	_	FB	5	3						Ŷ.	$\overrightarrow{\mathbf{X}}$									
-4 E	B120716			12-7-11	IDDG	RS	EB	-3-	4	П	Т	П	1	П	XI	V		- 1		l			10	, 1	- 1
-5 5	-400			12-7-16	1-46	25	111	-	दी	Ħ	_	17	$\neg \vdash$	\Box	7	7		IN	IAL.	SES	SME	NT		71	
	- 415			2718	1243	110	SW	7	기 -	-		+	+	H	∇	₽		- -	1		\vdash	\neg	7	7	7
	- 1111			12-7-16	1213	INK III	22	5		H		╂═┼	- -	-	4	÷		- t∧	EEL V	ERIF	CAT	UN	5/13		
	. 11 2 11 12	•		12-7-16	<u> 107 </u>	NK.	(OM	-6	5	Н	4	Н	+	Ш,	٤	χ.		+	├	_	ш		\equiv	=+	
J/ 5	S-41D MSI)		12-7-16	1331	NK	6W	5	5	Ш		П	\perp	Ш	X	Х.									
.7	5-405			12-7-16	1550	R 5	06 S/	-	5	П		П	-11	Н	XI	14	- 1	}						- 1	- 1
-8	C-AIS			17-7-16	11.51	AIR	SHAV	E	4	П	Т	П	$\neg \neg$	П	V.	V									
-4 -	- 1317 0716			12-7-16	1525	RS	FB	7	4	H	╈	H	\top	 	V	×			+	\vdash	\vdash		\neg		2131
	13120/10		Secure W	17-1-14	1322	2	U	3.	4	H		Н	+	H	4	-	lord lay							issi	2171
	emergent Tister (Business days)	100	20 PK 500	4.64	(NOSSERVA	0.000	0.00	Date	Deliver	Щ					201	200	OTHER DESIGNATION	August to a	Com	mente	/ Roecii	d Instruc	tions.	de la	of the particular has
	6 Bueinese Days		Approved By (Accus				- Demmerci	al"A" (La					ASP CA	Magor	y A				1 00						
	0 Business Days (by Contract or							al "B" [Li			Ξ		ASP Ca												
10 Da								Laval 3+4)				te Fern												ľ
☐ 6 Clay							C) Reduci				-		D Form	net _										_	
	EMERGENCY EMERGENCY					l L '	Commerci	el Turr Commercu		Dan 0					-	- 1									
	EMERGENCY							Commercia Commercia					WEARY			1									
	Rush T/A data avadable VVA Labiré							NJ Reduce	et = Rea	ه فقريم	QC 8	unma	ny - Pa												
		Con Town		nple Custody mu Received By:		ented be	low eact	Ume ser		chang shed P		88088	iton, ir	nclud	ing co	unter		Time.		Receive	d Bran			-	
, W.L.	14/8V-	[2-8	3-16 1300	Fe	d EX]	2			4	وز (8	,			طازعال	' ننده	2	Ju	(60	-1	عورم	
Rylman had by	Bempine.	Date Time:		Received By:				-	_	ahed B					200		_	Time		Reselve	of Mys		*		7
3 Retinatated by:		Date Time:		3 Received Bri					4 Sustady	Basi C	_		—,	12	<u>_</u>		Prepared to		able	4		Ontre		Cools V	
6				5				•	B.61	3.6	غدانا	15	٩	_	 							On 100	24.9	3.46	7.2.5

MC49081: Chain of Custody Page 1 of 2

EXECUTIVE NARRATIVE

SDG No:

MC49081

Laboratory:

Accutest, Massachusetts

Analysis:

MADEP VPH

Number of Samples:

11

Location:

BMSMC, Building 5 Area

Humacao, PR

SUMMARY:

Eleven (11) samples were analyzed for Volatiles TPHC Ranges by method MADEP VPH. Samples were validated following the METHOD FOR THE DETERMINATION OF VOLATILE PETROLEUM HYDROCARBONS (VPH) quality control criteria, Massachusetts Department of Environmental Protection, Revision 1.1 (2004). Also the general validation guidelines promulgated by the USEPA Hazardous Wastes Support Section. The QC criteria and data validation actions listed on the data review worksheets are from the

primary guidance document, unless otherwise noted.

Results are valid and can be used for decision making purposes.

Critical issues:

None

Major:

None

Minor:

None

Critical findings:

None

Major findings:

None

Minor findings:

1. Continuing and final calibration verification meets method specific requirements except in the cases described in the Data Review Worksheet. Results for rt5.5 - 7 petroleum hydrocarbons qualified as

estimated (J or UJ) in affected samples.

COMMENTS:

Results are valid and can be used for decision making purposes.

Reviewers Name:

Rafael Infante

Chemist License 1888

Signature:

Date:

January 7, 2017

SAMPLE ORGANIC DATA SAMPLE SUMMARY

Sample ID: MC49081-1

Sample location: BMSMC Building 5 Area

Sampling date: 12/6/2016

Matrix: AQ - Equipment Blank

METHOD: MADEP VPH

Analyte Name	Result	Units Di	ilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	50	ug/L	1	-	UJ	Yes 🗸 🖊
Ç9 - C12 Aliphatics (Unadj.)	50	ug/L	1	-	U	Yes
Ç9 - C10 Aromatics (Unadj.)	50	ug/L	1	-	U	Yes
Ç5 - C8 Aliphatics	50	ug/L	1	•	ÜJ	Yes 🗸
Ç9 - C12 Aliphatics	50	ug/L	1	-	U	Yes

Sample ID: MC49081-2

Sample location: BMSMC Building 5 Area

Sampling date: 12/6/2016 Matrix: Groundwater

Analyte Name	Result	Units D	ilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	15.5	ug/L	1	J	J	Yes
Ç9 - C12 Aliphatics (Unadj.)	16.9	ug/L	1	J	J	Yes
Ç9 - C10 Aromatics (Unadj.)	10.1	ug/L	1	J	J	Yes
Ç5 - C8 Aliphatics	12.0	ug/L	1	J	J	Yes
Ç9 - C12 Aliphatics	50	ug/L	1	-	U	Yes

Sample location: BMSMC Building 5 Area

Sampling date: 12/6/2016

Matrix: AQ - Field Blank Water

METHOD: MADEP VPH

Analyte Name	Result	Units Di	lution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	50	ug/L	1	_	UJ	Yes
Ç9 - C12 Aliphatics (Unadj.)	50	ug/L	1	-	U	Yes
Ç9 - C10 Aromatics (Unadj.)	50	ug/L	1	-	U	Yes
Ç5 - C8 Aliphatics	50	ug/L	1	-	UJ	Yes 🗸
Ç9 - C12 Aliphatics	50	ug/L	1	0.2	U	Yes

Sample ID: MC49081-4

Sample location: BMSMC Building 5 Area

Sampling date: 12/7/2016

Matrix: AQ - Equipment Blank

Analyte Name	Result	Units	Dilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	50	ug/L	1	•	UJ	Yes
Ç9 - C12 Aliphatics (Unadj.)	50	ug/L	1	3.43	U	Yes
Ç9 - C10 Aromatics (Unadj.)	50	ug/L	1		U	Yes
Ç5 - C8 Aliphatics	50	ug/L	1	-	UJ	Yes 🗸 /
Ç9 - C12 Aliphatics	50	ug/L	1	-	U	Yes

Sample location: BMSMC Building 5 Area

Sampling date: 12/7/2016 Matrix: Groundwater

METHOD: MADEP VPH

Analyte Name	Result	Units Di	lution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	50	ug/L	1	-	<u>UJ</u>	Yes
Ç9 - C12 Aliphatics (Unadj.)	50	ug/L	1	2	U	Yes
Ç9 - C10 Aromatics (Unadj.)	50	ug/L	1	-	U	Yes
Ç5 - C8 Aliphatics	50	ug/L	1	-	UJ	Yes 🗸
Ç9 - C12 Aliphatics	50	ug/L	1	-	U	Yes

Sample ID: MC49081-6

Sample location: BMSMC Building 5 Area

Sampling date: 12/7/2016 Matrix: Groundwater

Analyte Name	Result	Units D	ilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	50	ug/L	1	27	UJ	Yes
Ç9 - C12 Aliphatics (Unadj.)	50	ug/L	1	-	U	Yes
Ç9 - C10 Aromatics (Unadj.)	50	ug/L	1		U	Yes
Ç5 - C8 Aliphatics	50	ug/L	1	-	UJ	Yes 🗸
Ç9 - C12 Aliphatics	50	ug/L	1		U	Yes

Sample location: BMSMC Building 5 Area

Sampling date: 12/7/2016 Matrix: Groundwater

METHOD: MADEP VPH

Analyte Name	Result	Units D	Dilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	50	ug/L	1	-	UJ	Yes 🏏
Ç9 - C12 Aliphatics (Unadj.)	50	ug/L	1	-	U	Yes
Ç9 - C10 Aromatics (Unadj.)	50	ug/L	1	-	U	Yes
Ç5 - C8 Aliphatics	50	ug/L	1	•	UJ	Yes 🗸
Ç9 - C12 Aliphatics	50	ug/L	1	-	U	Yes

Sample ID: MC49081-8

Sample location: BMSMC Building 5 Area

Sampling date: 12/7/2016 Matrix: Groundwater

Analyte Name	Result	Units (Dilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	50	ug/L	1	_	UJ	Yes
Ç9 - C12 Aliphatics (Unadj.)	50	ug/L	1	44	U	Yes
Ç9 - C10 Aromatics (Unadj.)	50	ug/L	1	-	U	Yes
Ç5 - C8 Aliphatics	50	ug/L	1	-	UJ	Yes
Ç9 - C12 Aliphatics	50	ug/L	1	-	U	Yes

Sample location: BMSMC Building 5 Area

Sampling date: 12/7/2016

Matrix: AQ - Field Blank Water

METHOD: MADEP VPH

Analyte Name	Result	Units Di	lution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	50	ug/L	1	-	UJ	Yes 🗸
Ç9 - C12 Aliphatics (Unadj.)	50	ug/L	1	-	U	Yes
Ç9 - C10 Aromatics (Unadj.)	50	ug/L	1	-	U	Yes
Ç5 - C8 Aliphatics	50	ug/L	1	1/2	UJ	Yes 🗸
Ç9 - C12 Aliphatics	50	ug/L	1		U	Yes

Sample ID: MC49081-6MS

Sample location: BMSMC Building 5 Area

Sampling date: 12/7/2016

Matrix: Groundwater

Analyte Name	Result	Units D	ilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	277	ug/L	1	•	9	Yes
Ç9 - C12 Aliphatics (Unadj.)	438	ug/L	1	-	-	Yes
Ç9 - C10 Aromatics (Unadj.)	146	ug/L	1	-	-	Yes

Sample location: BMSMC Building 5 Area

Sampling date: 12/7/2016 Matrix: Groundwater

Analyte Name	Result	Units [Dilution Factor	Lab Flag	Validation	Reportable
Ç5 - C8 Aliphatics (Unadj.)	278	ug/L	1	-	□ J □	Yes 🗸
Ç9 - C12 Aliphatics (Unadj.)	437	ug/L	1	-	-	Yes
Ç9 - C10 Aromatics (Unadj.)	146	ug/L	1	-	-	Yes

DATA REVIEW WORKSHEETS

Type of validation	Full:X Limited:	Project Number:_MC49081 Date:12/06-07/2016 Shipping date:12/08/2016 EPA Region:2
REVIEW OF	VOLATILE PETROLE	UM HYDROCARBON (VPHs) PACKAGE
actions. This docume informed decision an assessed according to METHOD FOR THE Massachusetts Depa validation guidelines criteria and data validations.	ent will assist the review of in better serving the of the data validation guidn DETERMINATION OF withment of Environmental promulgated by the US	organics were created to delineate required validation wer in using professional judgment to make more needs of the data users. The sample results were lance documents in the following order of precedence VOLATILE PETROLEUM HYDROCARBONS (VPH), I Protection, Revision 1.1 (2004). Also the general SEPA Hazardous Wastes Support Section. The QC the data review worksheets are from the primary
The hardcopied (la received has been re review for SVOCs incl	eviewed and the quality of	itest_Laboratories data package control and performance data summarized. The data
No. of Samples: Field blank No.: Equipment blank No.: Trip blank No.:	MC49081-3;_MC490 MC49081-1;_MC490	081-9 081-4
X Data ComplX Holding TimN/A GC/MS TuniN/A Internal StarX BlanksX Surrogate RX Matrix Spike	es ing	X Laboratory Control SpikesX Field DuplicatesX CalibrationsX Compound IdentificationsX Compound QuantitationX Quantitation Limits
Overall _Volatiles_by_GC_by	_Method_MADEP_VPH,	_REV_1.1
<u> </u>		
Definition of Qualifiers	3:	
J- Estimated res U- Compound no R- Rejected data UJ- Estimated no Reviewer: January	ot detected indetect	

ere metx ee below
ECEIVED
<u> </u>
Discrepancies:

All criteria were met	_X	
Criteria were not met and/or see below		_

HOLDING TIMES

The objective of this parameter is to ascertain the validity of the results based on the holding time of the sample from time of collection to the time of extraction, and subsequently from the time of extraction to the time of analysis.

Complete table for all samples and note the analysis and/or preservation not within criteria

SAMPLE ID	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	ACTION
Samples ana		nod recommende		ample preservation

Criteria

Preservation:

Samples analyzed with ambient purge temperature: Samples must be acidified to a pH of 2.0 or less at the time of collection.

Samples analyzed with heated purge temperature: Samples must be treated to a pH of 11.0 or greater at the time of collection.

Methanol preservation of soil/sediment samples is mandatory. Methanol (purge-and-trap grade) must be added to the sample vial before or immediately after sample collection. In lieu of the in-field preservation of samples with methanol, soil samples may be obtained in specially-designed air tight sampling devices, provided that the samples are extruded and preserved in methanol within 48 hours of collection.

Holding times:

Aqueous samples using ambient or heated purge - analyze within 14 days. Soil/sediment samples - analysis within 28 days.

(Cooler	temperature	: (Criteria: -	4 <u>+</u> 2	°C):	2./°C	

<u>Actions:</u> Qualify positive results/non-detects as follows:

If holding times are exceeded, estimate positive results (J) and nondetects (UJ).

If holding times are grossly exceeded, use professional judgment to qualify data. The data reviewer may choose to estimate positive results (J) and rejects nondetects (R).

If samples were not at the proper temperature (> 10°C) or improperly preserved, use professional judgment to qualify the results.

All criteria were met	_x
Criteria were not met and/or see below _	

CALIBRATIONS VERIFICATION

Compliance requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing and maintaining acceptable quantitative data.

Matrix/Level:AQUEOUS/MEDIUM			
Instrument ID numbers:GCBH			
Dates of initial calibration verification:10/31/16_			
Date of initial ca	libration:	10/31/16_	

DATE	LAB FILE ID#	ANALYTE	CRITERIA OUT RFs, %RSD, %D, r	SAMPLES AFFECTED
Initi	ial and initial ca	libration verification	meet method specific r	equirements

Criteria- ICAL

- Five point calibration curve.
- The percent relative standard deviation (%RSD) of the calibration factor must be equal to or less than 25% over the working range for the analyte of interest. When this condition is met, linearity through the origin may be assumed, and the average calibration factor is used in lieu of a calibration curve.
- A collective calibration factor must also be established for each hydrocarbon range
 of interest. Calculate the collective CFs for C5-C8 Aliphatic Hydrocarbons and C9C12 Aliphatic Hydrocarbons using the FID chromatogram. Calculate the collective
 CF for the C9-C10 Aromatic Hydrocarbons using the PID chromatogram. Tabulate
 the summation of the peak areas of all components in that fraction against the total
 concentration injected. The %RSD of the calibration factor must be equal to or less
 than 25% over the working range for the hydrocarbon range of interest.

Criteria- CCAL

- At a minimum, the working calibration factor must be verified on each working day, after every 20 samples, and at the end of the analytical sequence by the injection of a mid-level continuing calibration standard to verify instrument performance and linearity.
- If the percent difference (%D) for any analyte varies from the predicted response by more than ±25%, a new five-point calibration must be performed for that analyte. Greater percent differences are permissible for n-nonane. If the %D for n-nonane is greater than 30, note the nonconformance in the case narrative. It should be noted that the %Ds are calculated when CFs are used for the initial calibration and

DATA REVIEW WORKSHEETS

percent drifts are calculated when calibration curves using linear regression are used for the initial calibration.

Actions:

If %RSD > 25% for target compounds or a correlation coefficient < 0.99, estimate positive results (J) and use professional judgment to qualify nondetects. If % D > 25% (> 30 for nonane), estimate positive results (J) and nondetects (UJ).

CALIBRATIONS VERIFICATION

Compliance requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing and maintaining acceptable quantitative data.

Date of initial calibration:	10/31/16
Dates of continuing calibration v	erification:12/13/16;_12/14/16
Dates of final calibration verifical	tion:_10/31/16;_12/13/16;_12/14/16_
Instrument ID numbers:	GCBH
Matrix/Level:AQL	JEOUS/MEDIUM

DATE	LAB FILE ID#	ANALYTE	CRITERIA OUT RFs, %RSD, <u>%D,</u> r	SAMPLES AFFECTED					
Continuing and final calibration verification meets method specific requirements except in the cases described in this document.									
12/13/16 12/13/16	cc2394-50 cc2394-50	rt5.5 - 7 rt5.5 - 7	28.7 % 32.0 %	MC49081-1 to -9; MC49081-6MS/- 6MSD					

Note: Results for rt5.5 - 7 petroleum hydrocarbons qualified as estimated (J or UJ) in affected samples.

A separate worksheet should be filled for each initial curve

			Criteria were no	All criteria were met ot met and/or see below _	
V A. BLANK	ANALYSIS RE	SULTS (Se	ctions 1 & 2)		
The assessment of contamination associated with with any blanks determine whet problem is an incomplement.	at of the blank on problems. the samples, s exist, all dat her or not the isolated occur er samples su	analysis res The criteria including tri ta associate re is an inhe rence not a	sults is to determing for evaluation of p, equipment, and ed with the case of erent variability in offecting other dat	ne the existence and mag f blanks apply only to d laboratory blanks. If pro must be carefully evalua the data for the case, o a. A Laboratory Method minated to determine if s	blanks oblems ated to r if the Blank
List the contam separately.	ination in the	blanks belo	ow. High and low	levels blanks must be t	treated
Laboratory blan	ks				
DATE ANALYZED	LAB ID	LEVEL/ MATRIX	COMPOUND	CONCENTRATION UNITS	
_METHOD_BLA	ANKS_MEET_	THE_METH	OD_SPECIFIC_C	RITERIA	
				100	
Note:					
Field/Trip/ <u>Equi</u>	<u>oment</u>				
				should continually acco ively, during sampling, st	
DATE ANALYZED	LAB ID	LEVEL/ MATRIX	COMPOUND	CONCENTRATION UNITS	
_NO_TRIP_BLA	NK_ASSOCI	ATED_WITH	1_THIS_DATA_PA	ACKAGE	
_NO_TARGET_ _WITH_THIS_D	_ANALYTES_[DATA_PACKA(DETECTED	_IN_FIELD/EQUIF	PMENT_BLANKS_ANALY	ZED_
Note:					

DATA REVIEW WORKSHEETS

All criteria were met _	_X
Criteria were not met and/or see below	

V B. BLANK ANALYSIS RESULTS (Section 3)

Blank Actions

The ALs for samples which have been diluted should be corrected for the sample dilution factor and/or % moisture, where applicable. Peaks must not be detected above the Reporting Limit within the retention time window of any analyte of interest. The hydrocarbon ranges must not be detected at a concentration greater than 10% of the most stringent MCP cleanup standard. Specific actions area as follows:

If the concentration is < sample quantitation limit (SQL) and < AL, report the compound as not detected (U) at the SQL.

If the concentration is \geq SQL but < AL, report the compound as not detected (U) at the reported concentration.

If the concentration is > AL, report the concentration unqualified.

SAMPLE ID

All criteria were met _	_X
Criteria were not met and/or see below	

ACTION

SURROGATE SPIKE RECOVERIES

Laboratory performance of individual samples is established by evaluation of surrogate spike recoveries. All samples are spiked with surrogate compounds prior to sample analysis. The accuracy of the analysis is measured by the surrogate percent recovery. Since the effects of the sample matrix are frequently outside the control of the laboratory and may present relatively unique problems, the validation of data is frequently subjective and demands analytical experience and professional judgment.

List the percent recoveries (%Rs) which do not meet the criteria for surrogate recovery. Matrix: solid/aqueous

SURROGATE COMPOUND

2,3,4	-Trifluorotoluene			
_SURROGATE_STAN _LIMITS	DARD_RECOVE	RIES_WITH	IN_LABORATOR	Y_CONTROL
		10 (5 (1) (1) (1) (1) (1) (1) (1) (1) (1) (1)		
QC Limits* (Aqueous)LL_to_UL QC Limits* (Solid)	_70_to_130_	to	to	
LL to UL	to	to	to	

It is recommended that surrogate standard recoveries be monitored and documented on a continuing basis. At a minimum, when surrogate recovery from a sample, blank, or QC sample is less than 70% or more than 130%, check calculations to locate possible errors, check the fortifying standard solution for degradation, and check changes in instrument performance.

If the cause cannot be determined, reanalyze the sample unless one of the following exceptions applies:

- (1) Obvious interference is present on the chromatogram (e.g., unresolved complex mixture);
- (2) Percent moisture of associated soil/sediment sample is >25% and surrogate recovery is >10%; or
- (3) The surrogate exhibits high recovery and associated target analytes or hydrocarbon ranges are not detected in sample.

If a sample with a surrogate recovery outside of the acceptable range is not reanalyzed based on any of these aforementioned exceptions, this information must be noted on the data report form and discussed in the Executive Report. Analysis of the sample on dilution may diminish matrix-related surrogate recovery problems. This approach can be used as long as the reporting limits to evaluate applicable MCP standards can still be achieved with the dilution. If not, reanalysis without dilution must be performed.

All criteria were met _	_X
Criteria were not met and/or see below	

VII. A MATRIX SPIKE/MATRIX SPIKE DUPLICATE (MS/MSD)

This data is generated to determine long term precision and accuracy in the analytical method for various matrices. This data alone cannot be used to evaluate the precision and accuracy of individual samples.

At the request of the data user, and in consideration of sample matrices and data quality objectives, matrix spikes and matrix duplicates may be analyzed with every batch of 20 samples or less per matrix.

- Matrix duplicate Matrix duplicates are prepared by analyzing one sample in duplicate. The purpose of the matrix duplicates is to determine the homogeneity of the sample matrix as well as analytical precision. The RPD of detected results in the matrix duplicate samples must not exceed 50 when the results are greater than 5x the reporting limit.
- The desired spiking level is 50% of the highest calibration standard. However, the total concentration in the MS (including the MS and native concentration in the unspiked sample) should not exceed 75% of the highest calibration standard in order for a proper evaluation to be performed. The purpose of the matrix spike is to determine whether the sample matrix contributes bias to the analytical results. The corrected concentrations of each analyte within the matrix spiking solution must be within 70 130% of the true value. Lower recoveries of n-nonane are permissible (if included in the calibration of the C9-C12 aliphatic range), but must be noted in the narrative if <30%.</p>

MS/MSD Recoveries and Precision Criteria	
Sample ID:_MC49081-6_MS/MSD	Matrix/Level:_Groundwater
List the %Rs, RPD of the compounds which do not	meet the QC criteria.

Note: MS/MSD % recovery and RPD within laboratory control limits.

No action is taken on MS/MSD results alone to qualify the entire case. However, used informed professional judgment, the data reviewer may use the MS/MSD results in conjunction with other QC criteria and determine the need for some qualification of the data. In those instances where it can be determined that the results of the MS/MSD affect only the sample spiked, the qualification should be limited to this sample alone. However, it may be determined through the MS/MSD results that the laboratory is having a systematic problem in the analysis of one or more analytes, which affects the associated samples.

DATA REVIEW WORKSHEETS

			Criteria w		ria were metX_ or see below
2. MS/MSD -	- Unspiked Compou	nds			
	ations of the unspike unspike unspiked sample, n				
COMPOUND	CONCENTRAT SAMPLE	ION MS	MSD	%RPD	ACTION
			., .,		
			1		
		1 10	2		
					,
Criteria: None spe	ecified, use %RSD <u><</u>	50 as	professiona	al judgment.	
Actions:					
If the % RSD is no), qualify the results in tot calculable (NC) du udgment to qualify s	ie to ne	ondetect va		

A separate worksheet should be used for each MS/MSD pair.

All criteria were metX_	
Criteria were not met and/or see below	

VIII. LABORATORY CONTROL SAMPLE (LCS/LCSD) ANALYSIS

This data is generated to determine accuracy of the analytical method for various matrices.

1. LCS Recoveries Criteria

List the %R of compounds which do not meet the criteria

LCS ID	COMPOUND	% R	QC LIMIT	ACTION	
LCS_RE	COVERY_WITHIN_L	ABORATOR	Y_CONTROL_LIM	тѕ	
			- 6		
	74 1972 1973				

Criteria:

- Refer to QAPP for specific criteria.
- * The spike recovery must be between 70% and 130%. Lower recoveries of n-nonane are permissible (if included in the calibration of the C9-C12 aliphatic range). If the recovery of n-nonane is <30%, note the nonconformance in the executive narrative.

Actions:

Actions on LCS recovery should be based on both the number of compounds that are outside the %R criteria and the magnitude of the excedance of the criteria.

If the %R of the analyte is > UL, qualify all positive results (j) for the affected analyte in the associated samples and accept nondetects.

If the %R of the analyte is < LL, qualify all positive results (j) and reject (R) nondetects for the affected analyte in the associated samples.

If more than half the compounds in the LCS are not within the required recovery criteria, qualify all positive results as (J) and reject nondetects (R) for all target analyte(s) in the associated samples.

2. Frequency Criteria:

Where LCS analyzed at the required frequency and for each matrix (1 per 20 samples per matrix)? Yes or No.

If no, the data may be affected. Use professional judgment to determine the severity of the effect and qualify data accordingly. Discuss any actions below and list the samples affected. Discuss the actions below:

	All criter Criteria were not met and/or se	ia were met e belowN/A
IX.	FIELD/LABORATORY DUPLICATE PRECISION	
Sample	e IDs:	Matrix:

Field/laboratory duplicates samples may be taken and analyzed as an indication of overall precision. These analyses measure both field and lab precision; therefore, the results may have more variability than laboratory duplicates which measures only laboratory performance. It is also expected that soil duplicate results will have a greater variance than water matrices due to difficulties associated with collecting identical field duplicate samples.

COMPOUND	SQL	SAMPLE CONC.	DUPLICATE CONC.	RPD	ACTION
No field/laboratory duplicate analyzed with this data package. MS/MSD % recovery RPD used to assess precision. RPD within laboratory and validation guidance document criteria (± 50 %) for analytes detected above reporting limits.					
crite	eria (<u>+</u> 50 %	6) for analytes dete	ected above reporting	limits.	

Criteria:

The project QAPP should be reviewed for project-specific information. RPD \pm 30% for aqueous samples, RPD \pm 50% for solid samples if results are \geq SQL. If both samples and duplicate are \leq SQL, the RPD criteria is doubled.

SQL = soil quantitation limit

Actions:

If both the sample and the duplicate results are nondetects (ND), the RPD is not calculable (NC). No action is needed.

Qualify as estimated positive results (J) and nondetects (UJ) for the compound that exceeded the above criteria.

If one sample result is not detected and the other is $\geq 5x$ the SQL qualify (J/UJ).

Note: If SQLs for the sample and duplicate are significantly different, use professional judgment to determine if qualification is appropriate.

If one sample value is not detected and the other is < 5x the SQL, use professional judgment to determine if qualification is appropriate.

All criteria were met _	_X
Criteria were not met and/or see below	

XI. COMPOUND IDENTIFICATION

The compound identification evaluation is to verify that the laboratory correctly identified target analytes as well as tentatively identified compounds (TICs).

- 1. Verify that the target analytes were within the retention time windows.
 - Retention time windows must be re-established for each Target VPH Analyte each time a new GC column is installed, and must be verified and/or adjusted on a daily basis.
 - o Coelution of the m- and p- xylene isomers is permissible.
 - All surrogates must be adequately resolved from individual Target Analytes included in the VPH Component Standard.
 - For the purposes of this method, adequate resolution is assumed to be achieved if the height of the valley between two peaks is less than 25% of the average height of the two peaks.
 - The n-pentane (C5) and MtBE peaks must be adequately resolved from any solvent front that may be present on the FID and PID chromatograms, respectively.

Note: Target analytes were within the retention time window.

2. If target analytes and/or TICs were not correctly identified, request that the laboratory resubmit the corrected data.

		Cı		teria were metX nd/or see below					
XII.	QUANTITATI	QUANTITATION LIMITS AND SAMPLE RESULTS							
The	sample quantitat	ion evaluation is to verify la	boratory quantitation	results.					
1.	In the space t	In the space below, please show a minimum of one sample calculation:							
Blan	k Spike	VPH (C9 –	C12 Aliphatics)	$RF = 9.607 \times 10^5$					
FID									
[]=	(34542073)/(9.60	07 x 10⁵)							
[]=	35.96 ppb Ok								
Blan	k Spike	VPH (C9 –	C10 Aromatics)	RF = 5.148 x 10 ⁵					
PID									
[]=	(25918225)/(5.14	48 x 10 ⁵)							
[]=	50.34 ppb Ok								
2. (MD		verify that the results were	above the laboratory	method detection limit					
3.		rformed, were the SQLs e amples and dilution factor i		by the laboratory? List					
	SAMPLE ID	DILUTION FACTOR	REASON FO	OR DILUTION					
		and the same							
7									
		rformed and the results we ected compounds. List the a							

EXECUTIVE NARRATIVE

SDG No:

MC49081

Laboratory:

Accutest, Massachusetts

11

Analysis:

MADEP EPH

Number of Samples:

Location:

BMSMC, Building 5 Area

Humacao, PR

SUMMARY:

Eleven (11) were analyzed for Extractable TPHC Ranges by method MADEP EPH. Samples were validated following the METHOD FOR THE DETERMINATION OF EXTRACTABLE PETROLEUM HYDROCARBONS (EPH) quality control criteria, Massachusetts Department of Environmental Protection, Revision 1.1 (2004). Also the general validation guidelines promulgated by the USEPA Hazardous Wastes Support Section. The QC criteria and data validation actions listed on the data review worksheets are from the primary guidance

document, unless otherwise noted.

Results are valid and can be used for decision making purposes.

Critical issues:

None

Major:

None

Minor:

None

Critical findings:

None

Major findings:

None

Minor findings:

 Initial and continuing calibration meets method specific requirements except for the cases described in the Data Review Worksheet. Results for C11 - C22 Aromatics qualified as estimated (J or UJ) in samples

MC49081-1 to MC49081-9.

Results for C19 - C36 Aliphatics qualified as estimated (J or UJ) in

samples MC49081-1 to MC49081-3.

COMMENTS:

Results are valid and can be used for decision making purposes.

Reviewers Name:

Rafael Infante

Chemist License 1888

Signature:

Date:

January 7, 2017

SAMPLE ORGANIC DATA SAMPLE SUMMARY

Sample ID: MC49081-1

Sample location: BMSMC Building 5 Area

Sampling date: 12/6/2016

Matrix: AQ - Equipment Blank

METHOD: MADEP EPH

Analyte Name	Result	Units [Dilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	100	ug/L	1	-	UJ	Yes
Ç9- C18 Aliphatics	100	ug/L	1	46	U	Yes
Ç19 - C36 Aliphatics	100	ug/L	1	- 2	UJ	Yes 🗸 🗸
Ç11 - C22 Aromatics	100	ug/L	1		UJ	Yes V

Sample ID: MC49081-2

Sample location: BMSMC Building 5 Area

Sampling date: 12/6/2016 Matrix: Groundwater

Analyte Name	Result	Units D	ilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	100	ug/L	1	-	UJ	Yes 🗸 🖊
Ç9- C18 Aliphatics	100	ug/L	1	-	U	Yes
Ç19 - C36 Aliphatics	100	ug/L	1		UJ	Yes 🗸 🖊
C11 - C22 Aromatics	100	ug/L	1	U	100	Yes V/

Sample location: BMSMC Building 5 Area

Sampling date: 12/6/2016

Matrix: AQ - Field Blank Water

METHOD: MADEP EPH

Analyte Name	Result	Units Di	lution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	100	ug/L	1	-	UJ	Yes
Ç9- C18 Aliphatics	100	ug/L	1	-	U	Yes
Ç19 - C36 Aliphatics	100	ug/L	1		UJ	Yes
Ç11 - C22 Aromatics	100	ug/L	1	-	UJ	Yes

Sample ID: MC49081-4

Sample location: BMSMC Building 5 Area

Sampling date: 12/7/2016

Matrix: AQ - Equipment Blank

Analyte Name	Result	Units D	ilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	100	ug/L	1	0.70	UJ	Yes 🗸
Ç9- C18 Aliphatics	100	ug/L	1		U	Yes
Ç19 - C36 Aliphatics	100	ug/L	1	-	U	Yes
Ç11 - C22 Aromatics	100	ug/L	1	4.73	UJ	Yes

Sample location: BMSMC Building 5 Area

Sampling date: 12/7/2016 Matrix: Groundwater

METHOD: MADEP EPH

Analyte Name	Result	Units Di	lution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	100	ug/L	1	-	UJ	Yes 🗸 🖊
Ç9- C18 Aliphatics	100	ug/L	1	-	U	Yes
Ç19 - C36 Aliphatics	100	ug/L	1	-	U	Yes
Ç11 - C22 Aromatics	100	ug/L	1	1.7	ÚJ	Yes 🖊

Sample ID: MC49081-6

Sample location: BMSMC Building 5 Area

Sampling date: 12/7/2016 Matrix: Groundwater

Analyte Name	Result	Units Di	lution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	100	ug/L	1	•	UJ	Yes
Ç9- C18 Aliphatics	100	ug/L	1	-	υ	Yes
Ç19 - C36 Aliphatics	100	ug/L	1	-	U	Yes
C11 - C22 Aromatics	100	ue/L	1	_	801	Yes V/

Sample location: BMSMC Building 5 Area

Sampling date: 12/7/2016 Matrix: Groundwater

METHOD: MADEP EPH

Analyte Name	Result	Units D	ilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	100	ug/L	1	-	UJ	Yes 🗸 🖊
Ç9- C18 Aliphatics	100	ug/L	1	-	U	Yes
Ç19 - C36 Aliphatics	100	ug/L	1	•	U	Yes
Ç11 - C22 Aromatics	100	ug/L	1		/UJ	Yes 🖊

Sample ID: MC49081-8

Sample location: BMSMC Building 5 Area

Sampling date: 12/7/2016 Matrix: Groundwater

Analyte Name	Resuit	Units D	ilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	31.5	ug/L	1	J	J	Yes
Ç9- C18 Aliphatics	25.9	ug/L	1	J	J	Yes
Ç19 - C36 Aliphatics	54.9	ug/L	1	J	J	Yes
Ç11 - C22 Aromatics	31.5	ug/L	1	J	J	Yes

Sample location: BMSMC Building 5 Area

Sampling date: 12/7/2016

Matrix: AQ - Field Blank Water

METHOD: MADEP EPH

Analyte Name	Result	Units Di	lution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	100	ug/L	1	-	CUJ	Yes 🗸
Ç9- C18 Aliphatics	100	ug/L	1	-	U	Yes
Ç19 - C36 Aliphatics	100	ug/L	1	_	U	Yes
Ç11 - C22 Aromatics	100	ug/L	1	-	UJ	Yes 🖊

Sample ID: MC49081-6MS

Sample location: BMSMC Building 5 Area

Sampling date: 12/7/2016 Matrix: Groundwater

Analyte Name	Result	Units D	ilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	833	ug/L	1	-	<u> </u>	Yes 🗸
Ç9- C18 Aliphatics	312	ug/L	1	-	-	Yes
Ç19 - C36 Aliphatics	417	ug/L	1	_	-	Yes

Sample location: BMSMC Building 5 Area

Sampling date: 12/7/2016 Matrix: Groundwater

Analyte Name	Result	Units D	ilution Factor	Lab Flag	Validation	Reportable
Ç11 - C22 Aromatics (Unadj.)	585	ug/L	1	-	5	Yes
Ç9- C18 Aliphatics	181	ug/L	1	-	_	Yes
Ç19 - C36 Aliphatics	348	ug/L	1	_	-	Yes

Type of validation	Full:X Limited:	Project Number:_MC49081
REVIEW OF EXT	RACTABLE PETROL	EUM HYDROCARBON (EPHs) PACKAGE
validation actions. This more informed decision were assessed according precedence METHOL HYDROCARBONS (El (2004). Also the gene Support Section. The (1995) and the section is the section of the sectio	s document will assist the and in better serving ding to the data validation FOR THE DETER PH), Massachusetts Deperal validation guidelines	tile organics were created to delineate required e reviewer in using professional judgment to make the needs of the data users. The sample results on guidance documents in the following order of MINATION OF EXTRACTABLE PETROLEUM partment of Environmental Protection, Revision 1.1 promulgated by the USEPA Hazardous Wastes dation actions listed on the data review worksheets as otherwise noted.
The hardcopied (laboreceived has been review for SVOCs included)	iewed and the quality co	st_Laboratories data package ntrol and performance data summarized. The data
No. of Samples: Field blank No.: Equipment blank No.:	MC49081 _11 _MC49081-3;_MC49081 _MC49081-1;_MC49081	Sample matrix:Groundwater
X Data CompleX Holding TimeN/A GC/MS TuninN/A Internal Stand	eteness es og dard Performance ecoveries Matrix Spike Duplicate	X Laboratory Control SpikesX Field DuplicatesX CalibrationsX Compound IdentificationsX Compound QuantitationX Quantitation Limits
Overall _Extractable_Petroleur	m_Hydrocarbons_by_GC	Comments: C_by_Method_MADEP_EPH,_REV_1.1
Definition of Qualifiers:		
J- Estimated resulu- Compound not R- Rejected data UJ- Estimated none	detected	
Reviewer:	el Defact	

	Criteria were not n	All criteria were metx net and/or see below
I. DATA COMPLETNE A. Data Packag		
MISSING INFORMATION	DATE LAB. CONTACTED	DATE RECEIVED
Service Control		
B. Other		Discrepancies:

All criteria were metX
Criteria were not met and/or see below

HOLDING TIMES

The objective of this parameter is to ascertain the validity of the results based on the holding time of the sample from time of collection to the time of extraction, and subsequently from the time of extraction to the time of analysis.

Complete table for all samples and note the analysis and/or preservation not within criteria

SAMPLE ID	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	ACTION
-	0,			
Samples	extracted and an	alyzed within me	thod recommend	ed holding time

<u>Criteria</u>

Preservation:

Aqueous samples must be acidified to a pH of 2.0 or less at the time of collection.

Soil samples must be cooled at 4 ± 2 °C immediately after collection.

Holding times:

Samples must be extracted within 14 days of collection, and analyzed within 40 days of extraction.

Cooler temperature (Criteria: 4	<u>+</u> 2 °	C):	<u>2.7°</u>	C
----------------------	-------------	--------------	-----	-------------	---

Actions: Qualify positive results/nondetects as follows:

If holding times are exceeded, estimate positive results (J) and nondetects (UJ). If holding times are grossly exceeded, use professional judgment to qualify data. The data reviewer may choose to estimate positive results (J) and rejects nondetects (R). If samples were not at the proper temperature (> 10°C) or improperly preserved, use professional judgment to qualify the results.

		Crite	All criteria ria were not met and/o	a were metX or see below
CALIBRAT	IONS VERIFIC	ATION		
	at the instrum		nstrument calibration producing and mai	
Dat	e of initial calib	ration:12/06	/16	
Dat	es of initial calil	oration verification:_	12/06/16	
Inst	rument ID num	bers:GCD	E	
Mat	rix/Level:	_AQUEOUS/MEDIUI	VI	
DATE	LAB FILE ID#	ANALYTE	CRITERIA OUT RFs, %RSD, %D, r	
	nitial and conti	nuing calibration me	et method specific requ	uirements

Criteria- ICAL

- Five point calibration curve.
- The percent relative standard deviation (%RSD) of the calibration factor must be
 equal to or less than 25% over the working range for the analyte of interest.
 When this condition is met, linearity through the origin may be assumed, and the
 average calibration factor is used in lieu of a calibration curve.
- A collective calibration factor must also be established for each hydrocarbon range of interest. Calculate the collective CFs for C9-C18 Aliphatic Hydrocarbons, C19-C36 Aliphatic Hydrocarbons, and C11-C22 Aromatic Hydrocarbons using the FID chromatogram. Tabulate the summation of the peak areas of all components in that fraction against the total concentration injected. The %RSD of the calibration factor must be equal to or less than 25% over the working range for the hydrocarbon range of interest.
 - o The area for the surrogates must be subtracted from the area summation of the range in which they elute.
 - The areas associated with naphthalene and 2-methylnaphthalene in the aliphatic range standard must be subtracted from the uncorrected collective C9-C18 Aliphatic Hydrocarbon range area prior to calculating the CF.

Criteria- CCAL

 At a minimum, the working calibration factor must be verified on each working day, after every 20 samples or every 24 hours (whichever is more frequent), and

- at the end of the analytical sequence by the injection of a mid-level continuing calibration standard to verify instrument performance and linearity.
- If the percent difference (%D) for any analyte varies from the predicted response by more than ±25%, a new five-point calibration must be performed for that analyte. Greater percent differences are permissible for n-nonane. If the %D for n-nonane is greater than 30, note the nonconformance in the case narrative. It should be noted that the %Ds are calculated when CFs are used for the initial calibration and percent drifts are calculated when calibration curves using linear regression are used for the initial calibration.

Actions:

If %RSD > 25% for target compounds or a correlation coefficient < 0.99, estimate positive results (J) and use professional judgment to qualify nondetects. If % D > 25% (> 30 for nonane), estimate positive results (J) and nondetects (UJ).

CALIBRATIONS VERIFICATION

Compliance requirements for satisfactory instrument calibration are established to ensure that the instrument is capable of producing and maintaining acceptable quantitative data.

Date of initial calibration:	12/06/16
Dates of continuing calibration verification:	12/20/16;_12/21/16;_12/26/16;_12/27/16_
Dates of final calibration verification:12/06	/16;_12/21/16;_12/26/16;_12/27/16
Instrument ID numbers:GCDE	
Matrix/Level:_SOIL/AQUEOUS/MEDIUM	

DATE	LAB FILE	ANALYTE	CRITERIA OUT	SAMPLES
	ID#		RFs, %RSD, <u>%D</u> ,	AFFECTED
			r	
Initial ar	nd continuing c	alibration meets metho	d specific requireme	nts except for the
		cases described in the	nis document.	
12/20/16	cc908-50	C19-C36 Aliphatics	25.2	MC49081-1 to -3
2:48 pm		4		
12/20/16	cc908-50	C11-C22 Aromatics	99.2	MC49081-1 to -3
11:13 pm				
12/21/16	cc908-50	C11-C22 Aromatics	99.1	MC49081-1 to -3
12/26/16	cc908-50	C11-C22 Aromatics	99.0	MC49081-4; -6; -7
12/27/16	cc908-50	C11-C22 Aromatics	99.1	MC49081-5; -8; -9

Note: Results qualified as estimated (J or UJ) in affected samples.

A separate worksheet should be filled for each initial curve

53		1		All criteria were met net and/or see below _	
V A. BLANK	ANALYSIS R				
The assessmemagnitude of oblanks associately broblems with evaluated to do case, or if the	ent of the blacontamination pated with the sany blanks e etermine whet problem is an must be run	ank analysis problems. The amples, inclusives, all data her or not the isolated occurrence after sample	results is to de criteria for evaluding trip, equipm a associated with ere is an inherent currence not affects suspected of b	etermine the existence uation of blanks apply of ent, and laboratory blast the case must be ca variability in the data fating other data. A Laborating highly contaminated	only to nks. In refully or the ratory
List the contar separately.	nination in the	blanks belov	w. High and low lo	evels blanks must be tr	eatec
Laboratory bla	nks				
DATE ANALYZED	LAB ID	LEVEL/ MATRIX	COMPOUND	CONCENTRATION UNITS	
METHOD B	LANKS MEET	THE METHO		TERIA	
Field/Trip/ <u>Equ</u>	<u>ipment</u>				
DATE ANALYZED	LAB ID	LEVEL/ MATRIX	COMPOUND	CONCENTRATION UNITS	
_NO_TARGE1	_ANĀLYTES_	DETECTED	_IN_FIĒLD/EQUIF	IIS_DATA_PACKAGE PMENT_BLANK	

All criteria were metX	_
Criteria were not met and/or see below	

V B. BLANK ANALYSIS RESULTS (Section 3)

Blank Actions

The ALs for samples which have been diluted should be corrected for the sample dilution factor and/or % moisture, where applicable. Peaks must not be detected above the Reporting Limit within the retention time window of any analyte of interest. The hydrocarbon ranges must not be detected at a concentration greater than 10% of the most stringent MCP cleanup standard. Specific actions area as follows:

If the concentration is < sample quantitation limit (SQL) and < AL, report the compound as not detected (U) at the SQL.

If the concentration is \geq SQL but < AL, report the compound as not detected (U) at the reported concentration.

If the concentration is > AL, report the concentration unqualified.

	All criteria were met _	_X
Criteria were r	not met and/or see below	

SURROGATE SPIKE RECOVERIES

Laboratory performance of individual samples is established by evaluation of surrogate spike recoveries. All samples are spiked with surrogate compounds prior to sample analysis. The accuracy of the analysis is measured by the surrogate percent recovery. Since the effects of the sample matrix are frequently outside the control of the laboratory and may present relatively unique problems, the validation of data is frequently subjective and demands analytical experience and professional judgment.

List the percent recoveries (%Rs) which do not meet the criteria for surrogate recovery. Matrix: solid/aqueous

SAMPLE ID		ATE COMPOU S2	ND S3	S4	ACTION
SURROGATE _LIMITS	_STANDARI	DS_RECOVER	IES_WITHIN_I	LABORATO	RY_CONTROL
Note:					
S1 = o-Terphen S3 = 1-Chlorood			S2 = 2-Fluoro S4 = 2-Bromo		
QC Limits (%)* (_LL_to_UL_ _QC Limits* (Soli	40_to_140_ d)			40_to_1	40_
_LL_to_UL_	to	to	to	to	_

It is recommended that surrogate standard recoveries be monitored and documented on a continuing basis. At a minimum, when surrogate recovery from a sample, blank, or QC sample is less than 40% or more than 140%, check calculations to locate possible errors, check the fortifying standard solution for degradation, and check changes in instrument performance.

If the cause cannot be determined, reanalyze the sample unless one of the following exceptions applies:

- (1) Obvious interference is present on the chromatogram (e.g., unresolved complex mixture);
- (2) The surrogate exhibits high recovery and associated target analytes or hydrocarbon ranges are not detected in sample.

If a sample with a surrogate recovery outside of the acceptable range is not reanalyzed based on any of these aforementioned exceptions, this information must be noted on the data report form and discussed in the Executive Report. Analysis of the sample on dilution may diminish matrix-related surrogate recovery problems. This approach can be used as long as the reporting limits to evaluate applicable MCP standards can still be achieved with the dilution. If not, reanalysis without dilution must be performed.

All criteria were met _X
Criteria were not met and/or see below

VII. A MATRIX SPIKE/MATRIX SPIKE DUPLICATE (MS/MSD)

This data is generated to determine long term precision and accuracy in the analytical method for various matrices. This data alone cannot be used to evaluate the precision and accuracy of individual samples.

At the request of the data user, and in consideration of sample matrices and data quality objectives, matrix spikes and matrix duplicates may be analyzed with every batch of 20 samples or less per matrix.

- Matrix duplicate Matrix duplicates are prepared by analyzing one sample in duplicate. The purpose of the matrix duplicates is to determine the homogeneity of the sample matrix as well as analytical precision. The RPD of detected results in the matrix duplicate samples must not exceed 50 when the results are greater than 5x the reporting limit.
- The desired spiking level is 50% of the highest calibration standard. However, the total concentration in the MS (including the MS and native concentration in the unspiked sample) should not exceed 75% of the highest calibration standard in order for a proper evaluation to be performed. The purpose of the matrix spike is to determine whether the sample matrix contributes bias to the analytical results. The corrected concentrations of each analyte within the matrix spiking solution must be within 40 140% of the true value. Lower recoveries of n-nonane are permissible but must be noted in the narrative if <30%.</p>

Sample ID: MC49029-1_MS/MSD _____ Matrix/Level: __Groundwater _____ Sample ID: MC49081-6_MS/MSD _____ Matrix/Level: __Groundwater _____ List the %Rs, RPD of the compounds which do not meet the QC criteria. MS OR MSD COMPOUND % R RPD QC LIMITS ACTION _____ ACTION ______

Note: MS/MSD and RPD within laboratory control limits.

DATA REVIEW WORKS	HEE12				
		C	riteria wer	All criteria w e not met and/or s	vere metX see below
No action is taken or informed professiona conjunction with othe data. In those instan affect only the sample However, it may be day systematic probler associated samples.	al judgment, the or QC criteria and oces where it ca le spiked, the que etermined throug	data d deter n be d ualifica ph the	reviewer r rmine the i determined tion should MS/MSD re	may use the MS need for some qual that the results if be limited to this esults that the lab	/MSD results in palification of the of the MS/MSD is sample alone. oratory is having
2. MS/MSD – Ur	nspiked Compou	nds			
List the concentration compounds in the uns	•				
COMPOUND	CONCENTRAT SAMPLE	ION MS	MSD	%RPD	ACTION
				part part	1000

Criteria: None specified, use %RSD ≤ 50 as professional judgment.

Actions:

If the % RSD > 50, qualify the results in the spiked sample as estimate (J). If the % RSD is not calculable (NC) due to nondetect value in the sample, MS, and/or MSD, use professional judgment to qualify sample data.

A separate worksheet should be used for each MS/MSD pair.

	Criteria were not met and/or see below					
VIII.	LABORATORY CONTROL SAMPLE (LCS/LCSD) ANALYSIS					
This da matrices.	ata is generated to determine accuracy of the analytical method for various					
1.	LCS Recoveries Criteria					
	List the %R of compounds which do not meet the criteria					
LCS ID	COMPOUND % R QC LIMIT ACTION					
N-NONANE	OVERY_WITHIN_LABORATORY_CONTROL_LIMTSRECOVERY_OF					
*	Refer to QAPP for specific criteria. The spike recovery must be between 40% and 140%. Lower recoveries of n-nonane are permissible. If the recovery of n-nonane is <30%, note the nonconformance in the executive narrative. RPD between LCS/LCSD must be < 25%.					
Actions: Actions on LCS recovery should be based on both the number of compounds that are outside the %R and RPD criteria and the magnitude of the excedance of the criteria.						
If the %R of the analyte is > UL, qualify all positive results (j) for the affected analyte in the associated samples and accept nondetects. If the %R of the analyte is < LL, qualify all positive results (j) and reject (R) nondetects for the affected analyte in the associated samples. If more than half the compounds in the LCS are not within the required recovery criteria, qualify all positive results as (J) and reject nondetects (R) for all target analyte(s) in the associated samples.						
2. Freque	ency Criteria:					
per matrix)? Y If no, the data the effect and	nalyzed at the required frequency and for each matrix (1 per 20 samples 'es or No. a may be affected. Use professional judgment to determine the severity of qualify data accordingly. Discuss any actions below and list the samples uss the actions below:					

	All criteria were metX Criteria were not met and/or see below				
IX. FIELD/LAE	BORATOR'	Y DUPLICATE PR	ECISION		
Sample IDs:		-	N	latrix:	
Field/laboratory duplicates samples may be taken and analyzed as an indication of overall precision. These analyses measure both field and lab precision; therefore, the results may have more variability than laboratory duplicates which measures only laboratory performance. It is also expected that soil duplicate results will have a greater variance than water matrices due to difficulties associated with collecting identical field duplicate samples.					
COMPOUND	SQL	SAMPLE CONC.	DUPLICATE CONC.	RPD	ACTION
No field/laborator used to assess p	y duplicate recision. R	analyzed with this PD within laborato	data package. MS/N ry and generally acce	SD rec ptable	overies RPD control limits
		7 - 12	vir.		
Criteria:					
The project QAPP should be reviewed for project-specific information. RPD \pm 30% for aqueous samples, RPD \pm 50% for solid samples if results are \geq SQL. If both samples and duplicate are $<$ 5 SQL, the RPD criteria is doubled.					
SQL = soil quantitation limit					
Actions:					
If both the sample and the duplicate results are nondetects (ND), the RPD is not calculable (NC). No action is needed.					
Qualify as estimated positive results (J) and nondetects (UJ) for the compound that exceeded the above criteria.					
If one sample result is not detected and the other is > 5x the SQL qualify (J/LJ)					

Note: If SQLs for the sample and duplicate are significantly different, use professional

If one sample value is not detected and the other is < 5x the SQL, use professional

judgment to determine if qualification is appropriate.

judgment to determine if qualification is appropriate.

All criteria were metX	<u> </u>
Criteria were not met and/or see below	

XI. COMPOUND IDENTIFICATION

The compound identification evaluation is to verify that the laboratory correctly identified target analytes as well as tentatively identified compounds (TICs).

- 1. Verify that the target analytes were within the retention time windows.
 - Retention time windows must be re-established for each Target EPH
 Analyte each time a new GC column is installed, and must be verified
 and/or adjusted on a daily basis.
 - The n-nonane (n-C9) peak must be adequately resolved from the solvent front of the chromatographic run.
 - All surrogates must be adequately resolved from the Aliphatic Hydrocarbon and Aromatic Hydrocarbon standards.
 - For the purposes of this method, adequate resolution is assumed to be achieved if the height of the valley between two peaks is less than 25% of the average height of the two peaks.
 - The n-pentane (C5) and MtBE peaks must be adequately resolved from any solvent front that may be present on the FID and PID chromatograms, respectively.
- 1a. Aliphatic hydrocarbons range:
 - o Determine the total area count for all peaks eluting 0.1 minutes before the retention time (Rt) for n-C9 and 0.01 minutes before the Rt for n-C19.
 - o Determine the total area count for all peaks eluting 0.01 minutes before the Rt for n-C19 and 0.1 minutes after the Rt for n-C36.

Are the aliphatic hydrocarbons range properly determined?

Yes? or No?

Comments:

- 1b. Aromatic hydrocarbons range:
 - Determine the total area count for all peaks eluting 0.1 minutes before the retention time (Rt) for naphthalene and 0.1 minutes after the Rt for benzo(g,h,i)perylene.
 - Determine the peak area count for the sample surrogate (OTP) and fractionation surrogate(s). Subtract these values from the collective area count value.

Are the aliphatic hydrocarbons range properly determined?

Yes? or No?

Comments:

Comments: Not applicable.

		Criter	a were not	All criteria met and/or		
2.	If target analytes a laboratory resubmit t		t correctly	identified,	request	that the
3.	Breakthrough determevaluated for potentially recovery of the fractional basis by quantifying and aromatic fractionaphthalene or 2-mathe total concentration LCSD, fractionat	al breakthrough on a actionation surrogate naphthalene and 2- ns of the LCS and ethylnaphthalene in tion for naphthalene	sample sp (2-bromor methylnaph LCSD. If e the alipha e or 2-met	ecific basis naphthalene nthalene in either the catic atic fractio	by evalue) and on both the concentre n exceed	ating the a batch aliphatic ation of ds 5% of the LCS
	NOTE:	The total conc methylnaphthalen summation of t aliphatic fraction a aromatic fraction.	e in the Lo he conce	CS/LCSD potration	oair inclu letected	ides the in the
	Comments:Conce _concentration_for_r					
4.	Fractionation Check containing 14 alkander each constituent. The fractionation efficience optimum hexane volument allowing signification of the fractional in the fractional i	es and 17 PAHs at a e Fractionation Chec by of each new lot o ume required to effic ant aromatic hydroc ctionation check soli	a nominal of k Solution of f silica gel/ iently elute arbon brea ution, exclu	concentration must be use cartridges, aliphatic hy akthrough. uding n-nor	on of 200 ed to eva and esta drocarbo For each lane, the	ng/µl of luate the blish the ons while analyte Percent
	Is a fractionation che	ck standard analyzed	1 ?		Yes?	or No?

All criteria were met _	_x
Criteria were not met and/or see below	

XII. QUANTITATION LIMITS AND SAMPLE RESULTS

The sample quantitation evaluation is to verify laboratory quantitation results.

In order to demonstrate the absence of aliphatic mass discrimination, the response ratio of C28 to C20 must be at least 0.85. If <0.85, this nonconformance must be noted in the laboratory case narrative.

The chromatograms of Continuing Calibration Standards for aromatics must be reviewed to ensure that there are no obvious signs of mass discrimination.

Is aliphatic mass discrimination observed in the sample?

Yes? or No?

Is aromatic mass discrimination observed in the sample?

Yes? or No?

1. In the space below, please show a minimum of one sample calculation:

MC49081-6MS

EPH (C11 – C22, Aromatics)

RF = 99940

[] = (34694533)/(99940)

[] = 347.15 ppb Ok

MC49081-6MS

EPH (C19 – C36, Aliphatics)

RF = 67800

[] = (12814172)/(67800)

[] = 189.0 ppb Ok

DATA REVIEW WORKSHEETS

- 2. If requested, verify that the results were above the laboratory method detection limit (MDLs).
- 3. If dilutions performed, were the SQLs elevated accordingly by the laboratory? List the affected samples and dilution factor in the table below.

SAMPLE ID	DILUTION FACTOR	REASON FOR DILUTION
-10.5		
		
	100.0	
102.07		
	11.00	
_ : : :		

If dilution was not performed, affected samples/compounds:	estimate results	(J) for the	affected	compounds.	List the